

WHAT IS CLAIMED IS:

1. A control program testing method for testing a control program which is written in a certain programming language by use of automatic code generation means which produces automatically a control program which is written in the programming language from a control model, with requisite control specifications thereof being written in a requisite control specifications writing language, the method comprising steps of:

producing operation results of a simulation means which simulates operation of the control model and operation results of program execution means which executes the control program, while making a relational linkage between individual corresponding operation results; and

testing presence or absence of abnormality in at least one of the control model and the control program.

2. A control program testing method as in claim 1,

wherein the relational linkage is made based on correspondence information which indicates the correspondence relationship between the control model which is provided at automatic generation of control program by the automatic code generation means and a control program which is produced from the control model.

25 3. A control program testing method as in claim 2,

wherein the relational linkage is made for one of the control model and the control program based on the setting of a break point

which specifies a suspend point of operation and for the other based on a setting of a corresponding break point based on the correspondence information.

- 5 4. A control program testing method as in claim 3,
 wherein the break point is adapted to set individually for
 functional blocks which constitute the control model.
- 10 5. A control program testing method as in claim 2,
 wherein output of operation results, with the relational
 linkage being made between the individual operation results, is
 implemented based on the execution and suspend of the control
 program, one line at a time, by the program execution means.
- 15 6. A control program testing method as in claim 2,
 wherein the testing of the presence or absence of abnormality
 is implemented by comparing means which compares successively
 between the operation results of the simulation means and the
 operation results of the program execution means in relational
20 linkage.
- 25 7. A control program testing method as in claim 6,
 wherein the successive comparison between the operation
 results of the simulation means and the operation results of the
 program execution means by the comparing means is implemented in
 terms of comparison between simulation sequence of the control model
 and execution sequence of the control program based on the

correspondence information.

8. A control program testing method as in claim 6,
wherein the successive comparison between the operation
5 results of the simulation means and the operation results of the
program execution means by the comparing means is implemented in
terms of comparison between variable values which are calculated
by the simulation of the control model and variable values which
are calculated by the execution of the control program based on
10 the correspondence information.

9. A control program testing method as in claim 8,
wherein the testing of the presence or absence of abnormality
by comparison between the variable values which are calculated by
15 the simulation of the control model and the variable values which
are calculated by the execution of the control program based on
the correspondence information is implemented in terms of
determination as to whether or not the difference between the
variable values calculated by the simulation of the control model
20 and the variable values calculated by the execution of the control
program is within an allowable range.

10. A control program testing method as in claim 6 further
comprising the step of:

25 producing, in the event of determination of the presence of
abnormality by the comparing means, a simulation spot of the control
model and the execution spot of the control program at a time point

of the determination as a result of the test.

11. A control program testing method as in claim 1 further comprising the step of:

5 making alterable at least one of the variable value held at the suspend point among the values calculated by the simulation of the control model and the variable value held at the suspend point among the values calculated by the execution of the control program when the simulation of the control model and the execution
10 of the control program are suspended during the test.

12. A control program testing method as in claim 1 further comprising the step of:

15 producing at least the operation result of the simulation means which simulates the operation of the control model and the operation result of the program execution means which executes the control program to display means to display visually.

13. A control program testing apparatus for testing a control
20 program which is written in a certain programming language by use of automatic code generation means which produces automatically a control program which is written in the programming language from a control model, with requisite control specifications thereof being written in a requisite control specifications writing
25 language, the apparatus comprising:

synchonizing means which produces operation results of simulation means which simulates operation of the control model

and operation results of program execution means which executes the control program, while making a relational linkage between individual corresponding operation results; and

5 testing means for testing presence or absence of abnormality in at least one of the control model and the control program based on output operation results.

14. A control program testing apparatus as in claim 13,
wherein the synchronizing means makes the relational linkage
10 based on correspondence information which indicates the correspondence relationship between the control model which is provided at automatic generation of control program by the automatic code generation means and a control program which is produced from the control model.

15 15. A control program testing apparatus as in claim 14,
wherein the synchronizing means makes the relational linkage
for one of the control model and the control program based on the setting of a break point which specifies a suspend point of operation
20 and for the other based on setting of a corresponding break point based on the correspondence information.

16. A control program testing apparatus as in claim 15,
wherein the break point is set individually for functional
25 blocks which constitute the control model.

17. A control program testing apparatus as in claim 14,

wherein output of operation result by the synchronizing means is implemented based on the execution and suspend of the control program, one line at a time, by the program execution means.

- 5 18. A control program testing apparatus as in claim 14 further comprising:

 comparing means which implements the testing of the presence or absence of abnormality by comparing successively between the operation results of the simulation means and the operation results
10 of the program execution means in relational linkage.

19. A control program testing apparatus as in claim 18,
 wherein the successive comparison between the operation results of the simulation means and the operation results of the
15 program execution means by the comparing means is implemented in terms of comparison between the simulation sequence of the control model and the execution sequence of the control program based on the correspondence information.

- 20 20. A control program testing apparatus as in claim 18,
 wherein the successive comparison between the operation results of the simulation means and the operation results of the program execution means by the comparison means is implemented in terms of comparison between variable values which are calculated
25 by the simulation of the control model and variable values which are calculated by the execution of the control program based on the correspondence information.

21. A control program testing apparatus as in claim 20,
wherein the testing of the presence or absence of abnormality
by comparison between variable values calculated by the simulation
5 of the control model and variable values calculated by the execution
of the control program based on the correspondence information is
implemented in terms of determination as to whether or not the
difference between the variable values calculated by the simulation
of the control model and the variable values calculated by the
10 execution of the control program is within an allowable range.

22. A control program testing apparatus as in claim 18 further
comprising:

15 producing, in the event of determination of the presence of
abnormality by the comparing means, the simulation spot of the
control model and the execution spot of the control program at the
time point of the determination as a result of the test.

23. A control program testing apparatus as in claim 13 further
20 comprising:

making alterable at least one of the variable value held at
the suspend point among the values calculated by the simulation
of the control model and the variable value held at the suspend
point among the values calculated by the execution of the control
25 program when the simulation of the control model and the execution
of the control program are suspended during the test.

24. A control program testing apparatus as in claim 13 further comprising:

display means which is adapted to display visually at least the operation result of the simulation means which simulates the 5 operation of the control model and the operation result of the program execution means which executes the control program.

25. A control program testing program which is used for testing a control program which is written in a certain programming language 10 by use of automatic code generation means which produces automatically a control program which is written in the programming language from a control model, with requisite control specifications thereof being written in a requisite control specifications writing language, the program comprising:

15 as means for execution through a computer for testing presence or absence of abnormality in at least one of the control model and the control program,

means for generating, from information provided at automatic 20 generation of the control program, correspondence information which indicates the correspondence relationship between the control model and the control program, and making a relational linkage between a suspend point of operation of simulation means which simulates the control model and a suspend point of operation of program execution means which executes the control program based on the 25 correspondence information;

means for directing the simulation means and the program execution means to proceed to the simulation and the program

execution;

means for detecting a suspend of the simulation means and a suspend of the program execution means following the simulation and program execution; and

5 means for comparing the simulation result of the control model and the execution result of the control program upon detecting suspends of simulation and program execution, and testing the presence or absence of abnormality based on the comparison result.

10 26. A control program testing program as in claim 25,

wherein the correspondence information includes execution position correspondence information which is information indicating the relationship between corresponding positions of the control model and the control program, and

15 wherein the means for making a relational linkage of suspend points based on the correspondence information is that which sets, by being rendered the setting of a break point which specifies a suspend point of operation of one of the simulation means and the program execution means, a break point which specifies a 20 corresponding spot of the other based on the execution position correspondence information.

27. A control program testing program as in claim 26,

wherein the means for testing the presence or absence of 25 abnormality based on the comparison result tests the presence or absence of abnormality by at least comparing the suspend point of simulation of the control model and the suspend point of execution

of the control program based on the execution position correspondence information.

28. A control program testing program as in claim 25,
5 wherein the correspondence information includes variable correspondence information which indicates the correspondence relationship between variable values pertaining to processing of the control model and variable values pertaining to processing of the control program, and

10 wherein the means for testing the presence or absence of abnormality based on the comparison result tests the presence or absence of abnormality by at least comparing the variable values calculated by the simulation of the control model and the variable values calculated by the execution of the control program based
15 on the variable correspondence information.

29. A control program testing program which is used for testing a control program which is written in a certain programming language by use of automatic code generation means which produces automatically a control program which is written in the programming language from a control model, with requisite control specifications thereof being written in a requisite control specifications writing language, the program being characterized by:

25 as means for execution through a computer for testing of presence or absence of abnormality in at least one of the control model and the control program,

means for generating, from information provided at automatic generation of the control program, correspondence information which indicates the correspondence relationship between the control model and the control program, and making a relational linkage between the suspend point of operation of simulation means which simulates the control model and the suspend point of operation of program execution means which executes the control program based on the correspondence information;

means for directing the simulation means and the program execution means to proceed to the simulation and the program execution;

means for detecting a suspend of the simulation means and a suspend of the program execution means following the simulation and program execution; and

means for producing the simulation result of the simulation means and the execution result of the program execution means upon detecting suspends of simulation and program execution.

30. A control program testing program as in claim 29,

wherein the means for producing the simulation result of the simulation means and the execution result of the program execution means comprises means for producing the operation results to display means to display visually.

31. A control program testing program as in claim 29,

wherein the correspondence information includes execution position correspondence information which is information

indicating the relationship between corresponding positions of the control model and the control program, and

wherein the means for making a relational linkage of suspend points based on the correspondence information is designed to set, by being rendered the setting of a break point which specifies a suspend point of operation of one of the simulation means and the program execution means, a break point which specifies a corresponding spot of the other based on the execution position correspondence information.

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